STRATOSPHERE TEMPERATURES.

[Discussion.]

In the March, 1919, number of the MONTHLY WEATHER REVIEW, Prof. Humphreys offers a tenable explanation of the comparatively low temperature of the base of the stratosphere. There remains the matter of the higher temperature of the greater heights of the stratosphere. Here are two feasible explanations, but neither is supported by positive evidence.

The first is the question of dust. If no dust, either cosmic or telluric, exists within the air of the stratosphere, then it differs from the air of the lower shell and leaves to be explained how cosmic dust can reach the earth. Dust is matter and if solar radiation sets up molecular motion in other matter it can not skip the dust particles; and since they can not absorb heat indefinitely they must become sources of radiation. Small as the dust particles of the stratosphere may be, it is immeasurably more than the molecule and its radiant power is great in proportion. Moreover, the curvature of surface, which affects the heating of high latitudes of the earth, does not affect the heating of dust particles at a distance from the earth. The cosmic dust of polar regions is not hidden in shadows; it is in perpetual sunlight.

There is also the possibility of heat from radio-activity in the stratosphere and of this form of energy there can be little doubt. Whether its source is highly electrified dust particles or some other form of matter does not concern the question. Some of it at least is transformed into heat. The only question is, does the transformed energy add appreciably to the temperature of the stratosphere?—*J. W. Redway, Meteorological Laboratory, Mount Vernon, N. Y.*

The temperature changes with elevation in the stratosphere appear to vary considerably from day to day. Thus:

1. The minimum temperature occurs at the base of the stratosphere; especially over an anticyclone. This appears to be the result of forced convections—the overrunning of northerly by westerly winds.

2. The recorded increase in temperature with elevation above the base of the stratosphere doubtless does not always represent the actual temperature distribution of the upper atmosphere. At these levels ventilation of the thermometer is occasionally insufficient, and the recorded temperatures therefore too high; unless obtained at night, which they seldom are.

However, there necessarily is some gain of temperature from the forced minimum at the base of the stratosphere to the somewhat higher temperature of radiation equilibrium—the temperature at which emission and absorption of radiation are equal. Now, the temperature at which emission is equal to the absorption, when the intensity of the incident radiation is constant, varies with the composition, or nature of the material concerned. Hence, as the composition of the atmosphere certainly must change with elevation it follows that there must also be some changes in the equilibrium temperature. Whether the equilibrium temperature of cosmic or other dust in the stratosphere is higher, or lower, than that of the air of that region is uncertain. It is certain, however, that the probable amount of such dust is too small for it to affect appreciably the temperature of the stratosphere in any case.

3. The temperature changes of the stratosphere as between cyclonic and anticyclonic regions probably are chiefly of dynamical origin, modified, perhaps, by changes in the intensity of the radiation from the lower atmosphere.

4. The thermally streaky, or stratified, condition of the upper atmosphere can only be due to imperfect mixing. Over anticyclones the stratosphere is, on the average, several degrees colder than it is over cyclones. Again, above a wide layer of cirrus clouds the upper air necessarily receives less incident radiation because cut off from below, and therefore grows colder, than it does when the skies are clear. In short, the stratosphere is unequally heated over different regions; and consequently its incessant horizontal circulations always keep it more or less thermally stratified.—*W. J. Humphreys.*

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BENJAMIN FRANKLIN'S RISK WITH LIGHTNING.

[*Reprinted from* Scientific American, New York, Aug. 9, 1919, p. 128.]

SCRANTON, PA., July 27.—When emulating Benjamin Franklin late yesterday afternoon, Andrew Loyak, of this city, was killed when a bolt of lightning followed the wet kite string from the skies. Loyak was struck in the back of the head. Death was instantaneous.

The above news item in the New York Times of Monday, July 28, 1919, affords material for laying proper emphasis on the great danger attending modern kite flying whether during thunderstorms or at less obviously dangerous seasons. Our natural desire to emulate the great scientist and statesman referred to, must be tempered by the more modern knowledge that Franklin's classic experiment was a very foolhardy one—though he did not know it.[1] * * * Our meteorological kite flyers use large-sized box kites held by fine piano wire and therefore would run the greatest danger from shocks and lightning strokes. They know this, have repeatedly seen the thin steel wire go up in a streak of rusty smoke, and therefore are very careful never to neglect making a very good "ground" from the reel or wire carrier to the wet soil where they must be to work the kites. The fliers themselves keep as dry as possible and avoid contact with the wire or string. Instruments devised for measuring the potential on the kite wire frequently indicate high voltages and a little spark gap in the circuit would show an almost constant flow of current from the kite and the wire through the reel into the ground. * * *

Considerable shocks have been experienced by the curiously inclined on perfectly clear days. * * *

If you use a reel for the kite string be sure to ground it as carefully as you would *any other lightning rod*, stand on dry ground yourself, and leave the string alone.

[1] Out of justice to Franklin, Prof. A. McAdie (in *Sci. Am.*, Sept. 6, 1919, p. 229) makes the following remarks:

"One sometimes sees on a bank note a picture of Franklin defying the lightning. There is the philosopher standing *out of doors*, with the approaching cloud and lightning flashes such as never occur in fact. It is explicitly stated in the letter [to Collinson, Oct. 19, 1752, old style] that the person holding the string 'must stand within a door or window or under some cover so that the silk ribbon will not be wet.'"